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EXAMINER	
LEE, HSIEN MING	

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 01/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/615,583	DANIEL ET AL.	
	Examiner	Art Unit	
	Hsien-ming Lee	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 December 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,5-18 and 20-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,5-18 and 20-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

HSIEN-MING LEE
PRIMARY EXAMINER

1/24/06

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 091604
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, , 8, 9, 13, 27-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Katata et al. (US 6,500,686) in view of Burkhart et al. (US 6,377,060).

In re claim 1, Katata et al. in Figs. 1A, 1B, 5, 6, and 12 and related text, teach a method for depositing material on a semiconductor wafer, wherein the wafer temperature is maintained within a temperature range, the method comprising:

- providing a target 31 comprising the material to be deposited;
- supporting the wafer 33 with a chuck 34;
- controlling a chuck temperature via a chuck power source controller 36 to control the wafer temperature to within the temperature range and wherein the chuck temperature is greater than the wafer temperature because the chuck 34 is heated to 450 °C (col. 9, lines 27-28) and the heat from the chuck 34 would then heat-up the wafer 33 up to 450 °C as well (col. 50-51) and
- depositing material (e.g. silicon oxide, col. 10, lines 37-39) from the target 31 onto the wafer 33 during which the wafer temperature is controlled by the chuck temperature to achieve a desired grain orientation since the deposited silicon oxide inherently is polycrystalline structure and has grains with a certain grain orientation.

Katata et al do not teach that the wafer is in a spaced-apart relation from the chuck.

Burkhart et al, however, teach a wafer support configuration, wherein the wafer 202 is in a spaced-apart relation from the chuck 600 comprising a central wafer support region 601 and a circumferential flange 603 (Fig.8 and col. 7, lines 42-45).

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time the invention was made, to modify the wafer support configuration of Katata et al. with the wafer support configuration as taught by Burkhart et al so that the wafer 33 of Katata et al. is spaced-apart relative to the chuck 34 of Katata et al. since by this manner it would provide a advantage to detect wafer damage and wafer bow (col. 3, lines 30-33, Burkhart et al).

In re claim 5, Katata et al. teach positioning the wafer 33 at a distance from the target 31 such that the wafer temperature exhibits a greater dependence on a chuck temperature than on other heat producing effects during the step of depositing material since adjusting the chuck temperature mainly controls the wafer temperature.

In re claim 8, Katata et al. teach controlling the chuck temperature at 450 °C (col. 9, lines 27-28).

In re claim 9, Katata et al. teach determining a wafer entry temperature using a probe 35 (Fig.12) prior to the step of depositing and controlling the chuck temperature via the chuck power source controller 36 in response to the wafer entry temperature (col. 10, lines 11-14).

In re claim 13, Katata et al, inherently teach the deposited material (e.g. silicon oxide, col. 10, lines 37-39) exhibits a desired grain orientation since silicon oxide grains has a certain grain orientation.

In re claims 27 and 28, Katata et al. inherently teach that a gravitational force is sufficient for supporting the wafer 33 on the chuck 34 since the wafer 33 is positioned on the surface of the chuck 34 by a gravitational force without using a clamp (Fig.12).

In re claim 29, Katata et al. teach that the wafer 33 is spaced' apart from the target 31 at a distance such that during the process of depositing the material the chuck temperature controls the wafer temperature within the temperature range notwithstanding the presence of other heat sources during the process of depositing the material.

In re claim 30, Katata et al. teach supporting the wafer 33 in a spaced apart relation from heating and cooling surfaces of the chuck 34 since the wafer temperature is controlled by heating and cooling the chuck 34.

In re claim 31, Katata et al. teach determining a wafer temperature via a probe 35 (Fig.12) during depositing and controlling the chuck temperature in response to the chuck temperature.

3. Claims 6, 7, 10, 11, 12, 14-18 and 20-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Katata et al. in view of Burkhart et al., as applied to claims 1 and 15 above, and further in view of AAPA ("applicant's admitted prior art").

In re claim 6, one of the ordinary skill in the art would have been motivated to apply the teachings of Katata et al. in view of Burkhart et al in depositing a metal, such as aluminum or aluminum because Katata et al suggest that the method can be applied to a sputtering or a CVD method (col. 10, lines 27-33), which can be used for depositing aluminum, as evidenced by AAPA (paragraph [0015]).

In re claim 7, this claim is prima facie obvious without showing that the claimed ranges achieve unexpected results relative to the prior art range. In re Woodruff, 16 USPQ2d 1935,

1937 (Fed. Cir. 1990). See also In re Huang, 40 USPQ2d 1685, 1688(Fed. Cir. 1996)(claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also In re Boesch, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and In re Aller, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious). In this case the chuck temperature is dependent upon the material to be deposited.

In re claim 10, the selection of the crystal orientation is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species. In re Jones, 162 USPQ 224 (CCPA 1955)(the selection of optimum ranges within prior art general conditions is obvious) and In re Boesch, 205 USPQ 215 (CCPA 1980)(discovery of optimum value of result effective variable in a known process is obvious). For example, AAPA teaches depositing aluminum with a <111> crystal orientation on the wafer (paragraph [0019]).

In re claims 11 and 12, AAPA also remedies the deficiency in Katata et al. in view of Burkhart et al. because AAPA teaches depositing an underlying layer (i.e. titanium) on the wafer prior to depositing the material, wherein the underlying layer has a <002> crystal orientation (paragraph [0019]).

In re claim 14, the selection of a space between the target and the wafer is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species. In re Jones, 162 USPQ 224 (CCPA 1955)(the selection of optimum ranges within prior art general conditions is obvious) and In re Boesch, 205 USPQ 215 (CCPA

1980)(discovery of optimum value of result effective variable in a known process is obvious) IN such as situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results.

In re claim 15, Katata et al. teach a physical vapor deposition chamber for depositing material on a wafer, wherein a wafer temperature is maintained within a temperature range, comprising:

- a target 31 formed the material to be deposited on the wafer 33;
- a chuck 34 for supporting the wafer 33 while depositing material on the wafer, wherein the wafer 33 is urged against an upper surface of the chuck 34 solely by gravitational force exerted by the wafer 33 against the chuck 34, since the wafer 33 is simply positioned on the surface of the chuck 34 without a clamp;
- a chuck heater 41, 42, 51 and 52 (Fig.1B); and
- a controller 36 for controlling the chuck heater, wherein the wafer 33 is spaced-apart from the target 31 (Fig.12) such that during deposition of the target material on the wafer 33 the wafer temperature is maintained within the temperature range in response to the heat flow from the chuck 34 to the wafer 33.

Katata et al. is silent as to the distance being 45 mm.

However, the selection of a space between the target and the wafer is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species. For example, the distance is dependent upon the wafer temperature and material to be deposited. In such a situation, the applicant must show that the particular range is

critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range. See M.P.E.P. 2144.05, III

In re claims 16 and 17, Katata et al. further teach that the wafer is heated by radiant heat flow from the chuck 34 to the wafer 33 since manipulating the chuck temperature substantially controls the wafer temperature.

In re claim 18, Burkhart et al. remedy the deficiency in Katata et al. in such a way that the chuck supports the wafer in a spaced apart relation from the chuck, as stated previously, to permit a chuck temperature, as controlled by the chuck heater 41, 42, 51 and 52, to substantially control the wafer temperature.

In re claim 20, AAPA also remedies the deficiency of Katata et al. in view of Burkhart et al. because AAPA teaches a pedestal cover 128 covers the chuck 126, wherein the pedestal cover 128 comprises a plurality of pads 127 on the upper surface thereof, and the wafer 106 is disposed on the plurality of pads. By combine AAPA with Katata et al. in view of Burkhart et al., it would provide a better deposition apparatus.

In re claim 21, one of the ordinary skill in the art would have been motivated to apply the teachings of Katata et al. in view of Burkhart et al. in depositing a metal, such as aluminum or aluminum because Katata et al suggest that the method can be applied to a sputtering or a CVD method (col. 10, lines 27-33), which can be used for depositing aluminum, as evidenced by AAPA (paragraph [0015]).

In re claims 22 and 23, these claims are prima facie obvious without showing that the claimed ranges achieve unexpected results relative to the prior art range. In re Woodruff, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also In re Huang, 40 USPQ2d 1685, 1688(Fed. Cir.

1996)(claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also In re Boesch, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and In re Aller, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious). In this case the temperature range is dependent upon the material to be deposited.

In re claim 24, Katata et al. teach a temperature measuring means 35 for determining wafer temperature, the controller 36 is response to the wafer temperature for controlling the chuck heater 41, 42, 51 and 52 in response thereto.

In re claim 25, the selection of the crystal orientation is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species. In re Jones, 162 USPQ 224 (CCPA 1955)(the selection of optimum ranges within prior art general conditions is obvious) and In re Boesch, 205 USPQ 215 (CCPA 1980)(discovery of optimum value of result effective variable in a known process is obvious). For example, AAPA teaches depositing aluminum with a <111> crystal orientation on the wafer (paragraph [0019]).

In re claim 26, Katata et al teach that the deposited material (e.g. silicon oxide, col. 10, lines 37-39) exhibits a desired grain orientation since silicon oxide grains has a certain grain orientation.

Response to Arguments

4. Applicant's arguments filed 12/5/2005 have been fully considered but they are not persuasive.

Applicant asserted that Katata et al. do not teach "supporting the wafer in a spaced-apart relation from a chuck because "the wafer 103 is fixed to the entire surface of the plate body 100 by electrostatic chucking force." (third through fourth paragraph on page 6 of the arguments)

In response to the arguments, Burkhart et al teach a wafer support means, wherein the wafer 202 is in a spaced-apart relative to the chuck 600 comprising a central wafer support region 601 and a circumferential flange 603 (Fig.8 and col. 7, lines 42-45).

By modifying the wafer support configuration of Katata et al. with the wafer support configuration as suggested by Burkhart et al the wafer 33 of Katata et al. is spaced-apart relative to the chuck 34. The motivation/suggestion for doing so is to provide a means to detect wafer damage and wafer bow (col. 3, lines 30-33, Burkhart et al) during and/or after depositing the target material onto the wafer.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsien-ming Lee whose telephone number is 571-272-1863. The examiner can normally be reached on Tuesday-Thursday (7:30 ~ 6:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hsien-ming Lee
Primary Examiner
Art Unit 2823

Jan 24, 2006

HSIEN-MING LEE
PRIMARY EXAMINER

1/24/06